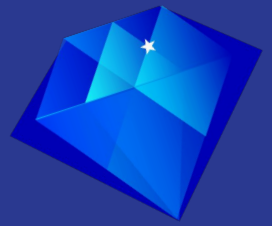
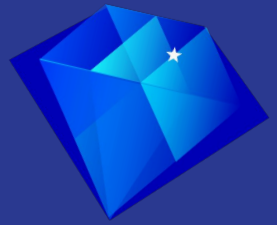


GEMS

Gym Equipment Monitoring System



Names

Parker Manson - Mansonpb@mail.uc.edu

Josh Miles - milesjo@mail.uc.edu

Project Abstract

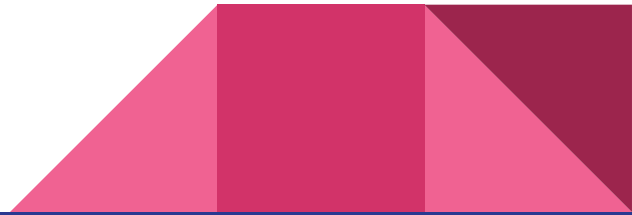
Project GEMS was created to solve the UC Rec Center’s issue with gym-goers waiting for equipment due to the gym’s complex layout. With similar machines scattered across rooms, users often struggle between waiting or searching for open equipment elsewhere. GEMS aims to address this by using existing cameras and a trained model to monitor and display real-time machine availability. This information will be accessible via a user-friendly website, enhancing the gym experience. Additionally, GEMS will collect data on equipment usage, making it valuable for broader commercial gym applications.

User Stories

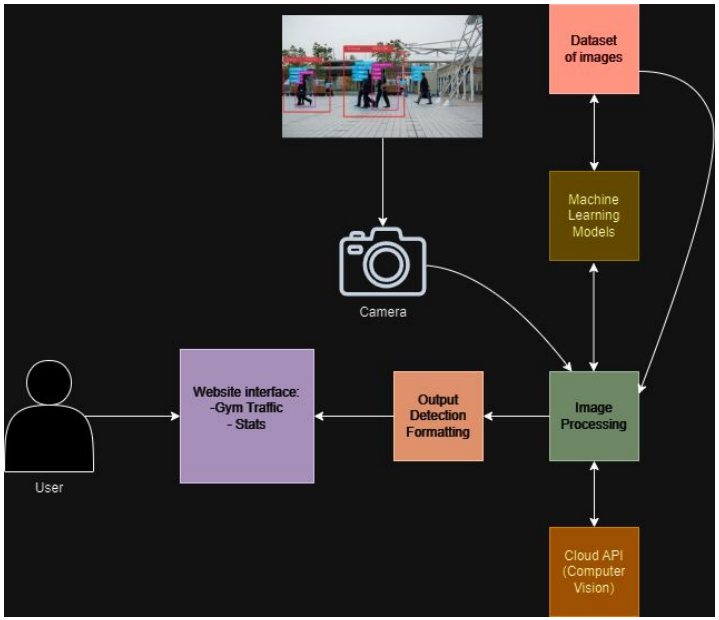
- As the owner of the gym, I want to have data of traffic in my gym, including what's being used and the frequency of use. This will help me make more informed business decisions.

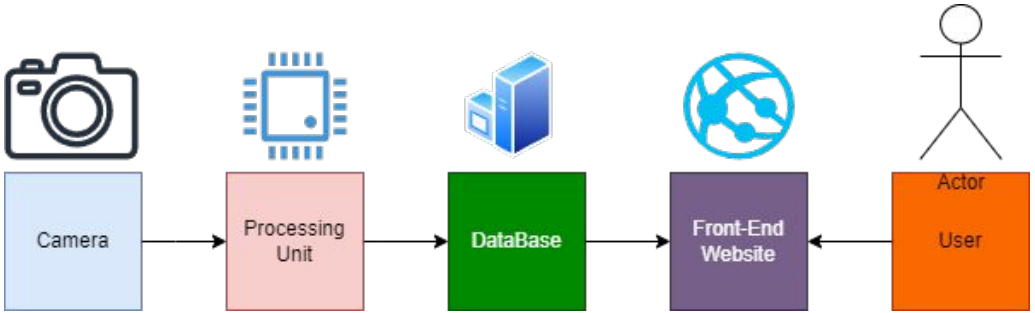
- As a patron/customer of the gym, I want to know what machines/areas are occupied and which ones are vacant. This will help me save time in my workout and prevent me from losing time waiting in lines for equipment.

- As a developer of the product, I want to be able to smoothly capture gym traffic and extrapolate the data into information for my customers, and my customer's customers. This will help sell the product.



Design Diagrams





Major Project Constraints

Legal Constraints:

- Compliance with privacy laws
- Ensure user consent to avoid unauthorized surveillance

Social Considerations:

- Goal: Improve workout experience with real-time equipment availability
- Benefit gym-goers by reducing wait times for equipment

Security Concerns:

- Protect video data from breaches
- Safeguard any user information stored on our website

Economic Limitations:

- Project funded by personal funds
- Focus on a cost-effective prototype using affordable equipment (e.g., camera) and open-source software

Review of Project Progress

Module Selection

- Explored multiple modules to identify the best fit for gym equipment detection
- Selected **YOLOv5** for deep learning and object detection

Data Collection

- Collected around **75 images total** across three equipment types:
  - **Dumbbell Bench**
  - **Treadmill**
  - **Chest Bench**

Model Evaluation

- Initial **Precision and Recall** metrics obtained for:
  - **Dumbbell Bench**
  - **Treadmill**

Website Development

- Created a **prototype website** showcasing system design and intended functionality

Expected Accomplishments

Performance Goals:

- Reach **75% Precision and Recall** for the 3 equitments
- Live Camera Integration with our YOLOv5 model

```
Validating runs\train\exp5\weights\best.pt...
Fusing layers...
Model summary: 157 layers, 7018216 parameters, 0 gradients, 15.8 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100%|          | 1/1 [00:01<00:00,  1.12s/it]
                   all          7         28      0.199      0.511      0.288      0.148
       dumbbell_bench           7          4      0.069       0.75      0.135     0.0687
                person          7         13      0.297      0.692      0.537      0.297
            Treadmill           7         11       0.23     0.0909      0.193     0.0771
Results saved to runs\train\exp5
```

Division of Work

Josh

- **Research ML Models:** 50%
- **Specify Gym Equipment:** 100%
- **Design System Architecture:** 25%
- **Gather Sample Images:** 75%
- **Train Model:** 25%

Parker

- **Research ML Models:** 50%
- **Design System Architecture:** 75%
- **Gather Sample Images:** 25%
- **Train Model:** 75%